Charlemont. Facing the house, a stone's throw or two in front of the lawn, was a river called the Tall, which ran into the close-at-hand Callan, which again ran into the Black Water, which, in turn, emptied itself into that immense puddle which bears the name of Lough Neagh. The waters of Lough Neagh, unable, by reason of the obstructions in the Lower Bann, to escape rapidly enough into the sea, swell up and cause backwater in the rivers I have named, and others as well. The result is the periodic flooding of thousands and tens of thousands of acres of valuable land, to the immense prejudice of the occupants and country at large. The Tall, I should observe, was banked or dyked up on both sides. In some places, however, the dyke had given way, so that at flood-time—and it was flood-time at the period I speak of—the waters of the Tall were awash with those of the flooded meads on both sides. There was further a rapid current in the Tall, and before it merged into the Callan the stream had to pass under the arch of a bridge which it filled to the crown. In fact the battlements themselves were nearly covered, and the country, as far as the eye could reach from the position which I at the moment occupied at the foot of the lawn, wore the aspect of a sea. At this precise juncture two horses, whilom occupants, I presume, of the then flooded meads, were to be seen slowly wading in the direction of the Tall. The green summit of the dyke was for the most part visible, and upon this the poor brutes mounted, in quest, I suppose, of some outlet. They had not gone very far when, owing to the treacherous footing, one of the horses lost his balance and fell, rolling over and over into the Tall. He swam on bravely, the other horse stretching down at intervals a sympathising muzzle, making indeed repeated efforts to escape, but falling back each time into the surging current. I was alone, surveying the transaction, from which I never removed my eyes, with the deepest interest. All at once the horse that was on the dyke, keeping pace at a sort of half-trot with the other, burst into a hand-gallop, and when he had got sufficiently beyond his struggling comrade, bounded himself into the Tall. Swimming briskly onwards for a few fathoms, he then made his way out through what he must have seen beforehand was a practicable breach in the dyke, followed on the instant by his friend, evading, not a moment too soon, the submerged bridge, where they would have otherwise inevitably gone under. So long as my eyes could follow them they dashed onwards at a gallop, throwing up their exultant heels and flourishing their tails across the flooded meadows. It is now many years since I beheld this astonishing spectacle, which my memory recalls as freshly as if it had happened yesterday, awakening, as I think it is well calculated to do, serious reflections in regard of our mysterious associates and the wondrous Power which has called them into being, and now sustains them and ourselves alike in this transitory state which we term life. HENRY MACCORMAC

Belfast, August

Radiation.—A Query

IN Baily's experiments with the torsion-rod and two leaden balls weighing 380½ pounds each, it was found that the radiation of heat from the leaden masses affected the vibrations of the torsion-rod. These masses were thereupon gilded, and the torsion-rod protected by a gilt box covered with thick flannel, and the disturbing influence overcome. How did radiation affect the motion of the torsion-rod? F. G. S.

"On a Mode of Explaining the Transverse Vibrations of Light"—The Expression "Radiant Matter"

WITHOUT wishing at all to underrate the apparent difficulty noticed by your New Zealand correspondent, Mr. J. W. Frankland (NATURE, vol. xxii. p. 317) in regard to my paper under the above heading (NATURE, vol. xxi. p. 256), as it would be against the interests of truth to do so; I may nevertheless call his attention to a letter of mine (NATURE, vol. xxi. p. 369), where an attempt is made to meet the difficulty in question. The point is to account for the circumstance (admitting that it is rendered necessary by physical evidence) that the velocity of propagation of gravity must, at least, be very much greater than that of light. I will merely confine myself here to recapitulating one of the main conclusions in a somewhat different form, viz., it appears to be necessary to look to a separate medium for gravity, or (more accurately) to *one* medium with particles of two grades of dimensions; the one set of particles having very minute mass, and consequently enormous velocity, and concerned in the effects of gravity; the other set, of much greater mass and slower velocity, concerned in the phenomena of light. It will, I think, be so far tolerably evident that if the *number* of the more minute set of particles be comparatively very great, the pressure produced by them would be correspondingly great, and therefore these particles would be mainly (*i.e.*, almost exclusively, if their number were sufficiently great)[1] concerned in producing gravity. On the other hand, on account of the extreme velocity of these particles, they could not apparently be appreciably concerned in the phenomena of light, since the molecules of gross matter would vibrate among them without appreciable resistance. For it is a well-known dynamical fact that the resistance opposed to the motion of a body in a medium *diminishes* as the velocity of the particles of the medium increases. It may be worth observing perhaps that this idea of three grades of dimensions in matter (viz. gross matter, light-carrying matter, and gravific matter) appears to be an old one. Thus a book was published in 1827 by Dr. Blair, formerly Regius Professor of Astronomy in the University of Edinburgh, entitled "Scientific Aphorisms" (to which my attention was called by Prof. Tait), where the idea of three grades of dimensions in matter is set forth, and a theory of gravity very similar to that of Le Sage expounded. Also M. Prevost ("Deux Traités de Physique mécanique") expresses, I believe, the view that matter exists fundamentally in three grades of magnitude.

It may be rather a curious fact to notice that if the theory, that the æther consists merely of finely sub-divided matter in the ultra-gaseous state, light being regarded as a vector property carried off by the atoms in their passage through the open structure of the vibrating molecules of gross matter, as suggested by the late Prof. Clerk Maxwell, article "Æther," new edition of the "Encyclopædia Britannica" (*i.e.*, with range of free path greater than planetary distance, NATURE, vol. xxi. p. 256),[2] should ultimately turn out to be substantially true; then the term "radiant matter," employed by Mr. Crookes in connection with his experimental researches, would have its practical application in nature on a large scale—or light would be actually propagated by "radiant matter." If, on an examination of the theory in that spirit of good-humoured impartiality representing entire freedom from the predilections of any school of thought (the best guarantee of truth)—the difficulties attaching to it should not be considered insurmountable; then it may be worth remarking that the theory, without violating in the least the essential principles of the firmly-established undulatory theory, contains nevertheless (in its corpuscular essence) *one* of the ideas of Newton; so that it would appear that the latter might not have been entirely wrong, nor the upholders of the opposite view completely right, but that a partial reconciliation of their rival ideas might be possible. S. TOLVER PRESTON

London, August 10

Earthquake in Smyrna

ACCOUNTS are freely coming forward, but they are of popular interest, seismological details being scanty. I must premise that in in 1862 I took great interest in promoting Abyssinian wells in Smyrna, and that large numbers were put down. When the French Company built the quay the new works there were similarly supplied, and the result has been that for some years the surface and pipe-wells in the parallel Marina and Frank Streets have been wanting in water.

Within a few hours after the earthquake it was noticed that both classes of wells, say 600 feet from the sea, were freely supplied with water. This fact appears to me deserving of record.

It is said that the earthquake was most felt near the Greek Cathedral of St. Photius, at the Three Corners in Frank Street. It was here the ground opened in the last century earthquake and swallowed up two men, as I heard by tradition; and I always walked across the churchyard in full remembrance.

Of late years some kind of a landslip took place on Mount Pagus, or the Castle Hill, where Alexander the Great fell asleep.

[1] It may be worth noting in connection with this that (according to a principle developed by Sir W. Thomson, *Phil. Mag.*, May, 1873) it appears that if the "elastic rigidity" of the *larger* particles were such that they suffered no appreciable diminution of velocity at rebound from gross matter, they would not be appreciably concerned in the effects of gravity (even if their number were comparable to that of the smaller set of particles).

[2] Also previous papers by the present writer (on the same subject)—*Phil. Mag.*, September and November, 1877, February, 1878, April and May, 1880.

In this new earthquake springs are said to have burst out on the side of Mount Sipylus. HYDE CLARKE

32, St. George's Square, S.W., August 9

New Biological Term

IN writing certain parts of a book on water-beetles, I find myself frequently desirous of indicating briefly but emphatically that some particular genus I may be mentioning consists of only a single species. If we take a rational or theoretical view of classification rather than an empirical one, it must be admitted that a genus consisting of only one species is almost as great an anomaly as a species that should consist of a single individual; and a special term to indicate the fact would be desirable. Mr. Pascoe has suggested to me that the expression "monotypical genus" meets the want: but I am not satisfied with this, for in the first place it is a phrase, not a word; and in the second place the use of the "typical" interferes with concentration of thought by the introduction of an alien suggestion. I therefore propose to use either the word "autogenus" or the word "monogenus" for the purpose, and on the whole prefer the former. Perhaps some one else may be able to suggest a better term, and I shall be very glad of an expression of opinion on the point.

Thornhill, Dumfriesshire D. SHARP

Depraved Taste in Animals

YOUR correspondent, Mr. Nicols, draws attention this week to what he terms the "depraved taste" for tobacco exhibited by several individuals of that species of Phalangistidæ known as the koala.

Whilst in Australia some years ago I myself remarked the same propensity amongst numerous *wild* specimens of the *Pharcolarctos cinereus*, in an abandoned tobacco-clearing not far from my residence, and, like Mr. Nicols, I also observed that no ill effects seemed to follow the consumption of the tobacco by the Koalæ. Now since the Phalangistidæ I had the opportunity of observing were perfectly wild, I cannot agree with Mr. Nicols that their taste for tobacco is a depraved one, although the desire for spirits which he mentions is of course decidedly unnatural.

These observations induced me to make several analyses of the Victorian tobacco, with the result of isolating an hitherto undiscovered vegetable alkaloid. A detailed account of my various experiments is contained in a paper read by me before the Melbourne Medical and Chemical Society, and printed in the fourteenth volume of the Society's *Transactions*.

F. R. GREENWOOD

St. Bartholomew's Hospital, E.C., August 14

Firing a Tallow Candle through a Deal Board

WILL the writer of "Physics without Apparatus" be good enough to specify the conditions of success for the above experiment? C. J. WOODWARD

Birmingham and Midland Institute, August 9

[Set up a ½-inch or ¾-inch plank of deal in the ground. It should be 6–8 inches wide. Ram small charge of gunpowder into gun with wad. Select a *dip* candle just fitting bore; cut down to about 5 inches long, with flat end. Be very particular to ram it down well; for if there is air space between it and the wad there is risk of bursting gun. Take care that the rest of barrel is cleared of bits of tallow. Fire at say 3 yards from plank. If you don't miss aim, there will be a hole *torn*, about 2 inches in diameter.—The WRITER of "Physics without Apparatus."]

$\sqrt{-1}$ must send his name and address.

THUNDERSTORMS [1]

II.

BEFORE I can go farther with this subject it is necessary that I should give some simple facts and illustrations connected with ordinary machine electricity. These will enable you to follow easily the slightly more difficult steps in this part of our subject which remain to be taken.

Since we are dealing mainly with *motion* of electricity, it is necessary to consider to what that motion is due. You all know that winds, *i.e.* motions of the air, are due to differences of pressure. If the pressure were everywhere the same at the same level we should have no winds. Similarly the cause of the motion of heat in a body is difference of temperature. When all parts of a body are at the same temperature there is no change of distribution of heat. Now electricity presents a precisely analogous case. It moves in consequence of difference of *potential*. Potential, in fact, plays, with regard to electricity, a part precisely analogous to the *rôle* of pressure, or of temperature, in the case of motions of fluids and of conducted heat. Now the power of an electrical machine may be measured by the utmost potential it can give to a conductor. The greater the *capacity* of the conductor the longer time will be required for the machine to charge it; but no electricity passes between two conductors charged to the same potential. Hence the power of a machine is to be measured by using the simplest form of conductor, a sphere, and finding the utmost potential the machine can give it. It is easily shown that the potential of a solitary sphere is directly as the quantity of electricity, and inversely as the radius. Hence electricity is in equilibrium on two spheres connected by a long thin wire when the quantities of electricity on them are proportional—not to their surfaces, nor to their volumes, as you might imagine—to their radii. In other words, the capacity is proportional to the radius. This, however, is only true when there are no other conductors within a finite distance. When a sphere is surrounded by another concentric sphere, which is kept in metallic connection with the ground, its capacity is notably increased, and when the radii of the spheres are nearly equal the capacity of the inner one is directly as its surface, and inversely as the distance between the two spheres. Thus the capacity is increased in the ratio of the radius of one sphere to the difference of the radii of the two, and this ratio may easily be made very large. This is the principle upon which the Leyden jar depends.

It is found that the work required to put in a charge is proportional to the square of the charge. Conversely, the damage which can be done by the discharge, being equal to the work required to produce the charge, is proportional to the square of the charge, and inversely to the capacity of the receiver. Or, what comes to the same thing, it is proportional to the square of the potential and to the capacity of the conductor directly. Thus a given quantity of electricity gives a greater shock the smaller the capacity of the conductor which contains it. And two conductors, charged to the same potential, give shocks proportional to their capacities. But in every case, a doubling of the charge, or a doubling of the potential, in any conductor, produces a fourfold shock.

The only other point I need notice is the nature of the distribution of electricity on a conductor. I say *on* a conductor, because it is entirely confined to the surface. Its attractions or repulsions in various directions exactly balance one another at every point in the *substance* of the conductor. It is a most remarkable fact that this is always possible, and in every case in one way only. When the conductor is a single sphere the distribution is uniform. When it is elongated the quantity of electricity per square inch of its surface is greater at the ends than in the middle; and this disproprotion is greater the greater is the ratio of the length to the transverse diameter. Hence on a very elongated body, terminating in a point, for instance, the electric density—that is, the quantity per square inch of surface—may be exceedingly great at the point while small everywhere else. Now in proportion to the square of the electric density is the outward pressure of the electricity tending to escape by forcing a passage

[1] Abstract of a lecture, delivered in the City Hall, Glasgow, by Prof Tait. Continued from p. 341.